FACT SHEET

L-714

UNDERSTANDING NUCLEAR RADIATION

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Understanding nuclear radiation is important because our everyday life is becoming more and more associated with nuclear energy. Nuclear radiation has become a factor in life of which we must be aware and with which we must learn to live.

OLD AS THE SUN

Many people associate radioactivity only with a nuclear explosion. Yet, even prehistoric man was exposed to radiation, for radiation is as old as the sun. The sun is, in fact, the oldest nuclear reactor. It radiates a full range of visible and invisible rays. Everyone has sun burned. The skin peels and for several days some discomfort is felt. When this happens, the skin has been over-exposed to the sun's visible radiation.

Yet the sun's radiation does not cause any great concern, other than the taking of normal precautions to prevent sun burns from excessive exposure. Most of the invisible and harmful "cosmic" rays from the sun are filtered out by the earth's atmosphere. This is illustrated by the fact that total radiation from the sun is greater in Denver, which is 1 mile above sea level, than in New York, a sea level city.

The earth would be showered by large quantities of cosmic radiation from the sun and other stars were it not for the shielding effect of the earth's atmosphere. Air surrounding our planet blocks and absorbs most cosmic radiation, so that only a harmless trickle gets through.

SOURCES OF RADIATION

The sun is not our only exposure to natural radiation. In addition, natural radioactive materials are found in the earth itself (radium, uranium and other radioactive minerals) which add to the normal amount of radiation from outer space. This combined total is called "background radiation" and is always present in extremely low and harmless levels, as a part of nature.

Man-made radiation, on the other hand, is relatively new and comes from X-ray machines and fluoroscopes, from nuclear fission and fusion (as in atomic power plants or from nuclear testing), and from the radioactive materials created by the fission or fusion processes. All of these sources of radiation are normally confined to special locations and controlled conditions where both distance and heavy shielding are employed to eliminate any radiation hazard to man. Even the containers and vehicles used to transport radioactive materials over rail and highway are especially designed and shielded to eliminate most radiation danger. Only in the event of an accident would these sources pose any threat to us.

BEHAVIOR OF RADIATION

Radioactivity is nature's method of restoring atomic equilibrium in unstable materials by releasing electric energy. All materials are made up of atoms. These atoms are normally at rest and in a stable condition. When the atoms are made unstable they become "charged" like a battery. Nature then steps in to re-establish equilibrium. One by one, each of the atoms jumps back to its normal state and, as it does, rids itself of its energy "charge." In time, when all of the atoms have jumped back into a normal state, the process stops, and the material is no longer radioactive. This progressive reduction in radiation is called "decay."

WHAT IS RADIATION LIKE?

Many people mistakenly picture radiation as a kind of gas or vapor that floats through the air, under door cracks and into windows. In truth, radiation—from an object that is radioactive—is more like a kind of "beam" or "wave" of electrical energy, similar in many ways to the wave sent out by your local radio station and picked up by your home radio.

However, while atomic radiation is like radio waves in some ways, it is in other ways unlike these harmless beams that surround us and pass through us invisibly all of the time. Atomic radiation (the same as we receive from the sun, from the earth, from X-ray or radar) can be harmful to any living

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organism when exposure is either too intense or too prolonged. Non-living objects, on the other hand, are not affected by radiation and will not become radioactive.

Therefore, non-living foodstuffs, such as vegetables or meats, can be consumed safely even if exposed to strong radiation, as long as the radioactive material itself does not actually get mixed into the food. Like the common radio signal, this electrical energy called "radiation" is completely invisible, silent, odorless and tasteless, and can pass through objects it encounters without making them "radioactive."

Accidents with radiation are possible. Today, a community needn't become involved in a nuclear war to be faced with a crisis involving radioactivity. Radioactive substances are now being transported by land, sea and air.

A simple accident between a truck transporting radioactive material through your community and another vehicle could bring radiation into your area. In the event of such an accident, or in the case of an accidental detonation of some kind of nuclear device, the "flash" radiation would last only as long as any actual fission or fusion lasted (perhaps 2 or 3 minutes) and would then be over. However, if any particles of radioactive material were released, they could have a more lasting effect.

The particles of matter could consist of special radioactive substances from the nuclear process, or might consist of such everyday materials as dirt, sand or fine dust, whose atomic structure has been altered or "charged" by fission or fusion, making them radioactive. Each small particle of matter is a source of radiation until its atoms have "decayed" back to a stable non-radiating condition.

EFFECTS OF RADIATION

Excessive radiation is harmful to any living organism exposed to it, and, if intense or prolonged enough, can cause radiation burns, radiation sickness or even death.

Whether the radiation comes from an X-ray machine, the sun, a nuclear explosion, "fallout" particles following such an explosion, natural deposits of radioactive materials in the earth or from the materials of a nuclear accident, its effects are the same and differ only in their degree. Radiation kills and injures individual body cells as it passes through living tissue. Therefore, as exposure to radiation reaches more intense levels and more prolonged periods, actual body damage does take place.

Moderate exposure kills or injures enough living body cells or blood cells to cause sickness, but recovery can be expected as the body is able to repair the damage over a period of time. However, prolonged exposure, or exposure at high levels produces radiation burns and cell damage from which the body cannot recover. But remember . . . even prolonged exposure does not make a person "radioactive!"

EMERGENCY PREPAREDNESS PAYS

Understanding the nature of nuclear radiation is the best way to prepare yourself to live with it. Remember, your three best defenses against excessive nuclear radiation are:

1. *Time* to allow for the decay process to make the radiating material harmless. Nothing can destroy radioactivity except time and its own decay.

2. *Distance* from the radiating material. Distance is a natural protection, because radiation exposure is less the farther away a person is from the source.

3. *Shielding* to provide temporary protection from radiation. Shielding simply means getting a mass of material between you and the radiation source. This is your most important protection, and is found in private or public shelters or in a protected corner of your basement. Don't take chances. Go to a protection area if you even suspect fallout.

Nuclear energy and radiation are here to stay. They will always be with us. Like electricity, radiation can be very dangerous and harmful if not controlled properly. However, also like electricity, we can learn to protect ourselves from excessive radiation and live with it safely so that its effects, such as in cobalt treatments to halt cancer, will be beneficial to us.

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